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1. Scope

This Standard Operating Procedure applies to the staff and students of the Pharmacy Department to follow the health and safety guidelines implemented for the laboratories of the Pharmacy Department, University of Malta.

2. Objective

To define the health and safety guidelines adopted for the laboratories of the Pharmacy Department, University of Malta.

3. Definitions

3.1. Biological waste: Waste containing mostly natural organic materials such as biological fluids, animal excrement and plant remains.

3.2. Bunsen burner: A small laboratory burner consisting of a vertical metal tube connected to a gas source and producing a very hot flame from a mixture of gas and air, let in through adjustable holes at the base.

3.3. Carbon dioxide fire extinguisher: A carbon dioxide based fire extinguisher, extinguishing the fire by eliminating the oxygen element of the fire triangle. It comes in a standard black container and is used on Class B and C fires only since it is ineffective on Class A fires.

3.4. Chemical hood: Formerly known as a fume cupboard, this is the primary control device used to avoid exposure when handling flammable and toxic chemicals. It mainly consists of a partially enclosed workspace that is exhausted to the outside of the building.

3.5. Class A Fire: Arises from ordinary combustible materials such as paper, wood, cardboard and plastic.

3.6. Class B Fire: Arises from flammable or combustible liquids such as gasoline, kerosene, petroleum oil, thinners and flammable gases such as propane and butane.

3.7. Class C Fire: Arises from energised electrical equipment such as appliances, switches, hot plates, stirrers and computers. Cutting the power supply will change this fire into one of the other types of fire.
3.8. Dehydrating agent: A chemical that is capable of removing water molecules from another agent.

3.9. Fire Triangle: Represents the 3 elements that must be present for a fire to exist and these are oxygen, heat and fuel.

3.10. Flammable agent: A chemical that can easily ignite and start a fire.

3.11. Foam fire extinguisher: A foam based extinguisher, extinguishing the fire by eliminating the heat element of the fire triangle. It comes in a standard cream container and can be used on Class A and B fires only. No to be used with Class C fires due to risk of an electrical shock.

3.12. General waste: Non-hazardous waste that does not pose an immediate threat to men and the environment.

3.13. Hazardous waste: Waste that may cause injury to the exposed individual or the environment.

3.14. Inventory: A detailed list of all the chemicals present in the laboratories and in the stores, together with their quantities.

3.15. Material Safety Data Sheet (MSDS): A sheet that contains data regarding the properties of each chemical and is intended to provide laboratory personnel with the procedures for handling or working with chemicals in a safe manner. Although no standardised format is present, an MSDS contains information about the physical properties of the chemical (e.g.: melting point, boiling point etc), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment to be used and spill handling procedures.

3.16. Organic agent: A substance which is typically characterised as having carbon and hydrogen as its main building blocks, but may also contain oxygen, nitrogen and a variety of other elements.

3.17. Oxidising agent: A chemical that readily transfers oxygen atoms or gains electrons in a redox reaction, becoming reduced in the process.

3.18. Powder Dry Chemical Extinguisher: A powder based extinguisher, extinguishing the fire by primarily interrupting the chemical reaction of
the fire triangle. It comes in a standard blue container and can be used on Class A, B and C fires.

3.19. **Reducing agent**: A chemical that donates electrons in a redox reaction, becoming oxidised in the process.

3.20. **Session**: A 2-3 hour laboratory exercise for second, third and fourth year pharmacy students as part of their academic curriculum.

4. **Responsibility**

4.1. The members of the Department of Pharmacy (staff and students) are responsible for following the SOP.

4.2. The designated Laboratory Officer or Laboratory Assistant is responsible for ensuring that this SOP is followed.

5. **Procedure**

5.1. **General Safety**

5.1.1. Ensure that only authorised personnel are allowed in the laboratory and that their entry is recorded in the Entry Logbook.

5.1.2. Ensure that no more than 10 students are present per session.

5.1.3. Do not run or throw items in the laboratory.

5.1.4. Be alert for unsafe conditions and actions and call attention to them so that corrective action can be taken.

5.1.5. Ensure that defective equipment is not used.

5.1.6. Do not sit on laboratory benches.

5.1.7. Do not eat, drink, smoke, chew gum, apply cosmetics or manipulate contact lenses in the laboratory.

5.1.8. Tie long hair.

5.1.9. Remove any scarves and coats.

5.1.10. Remove any dangling jewellery to prevent unnecessary accidents.

5.1.11. Place any bags or clothes in a designated area out of the way.

5.1.12. Ensure that work areas are kept clean and uncluttered.

5.1.13. Ensure that floor is kept clear of all objects.
5.1.14. Ensure that no flammable solvents are in the surrounding area when lighting a flame.
5.1.15. Ensure that lit Bunsen burners are not left unattended.
5.1.16. Keep waste in its appropriate containers and label them for proper disposal.
5.1.17. Wash hands well with soap and water after handling chemicals.

5.2. Lab Wear

5.2.1. Wear a cotton or polycotton lab coat and keep it buttoned at all times.
5.2.2. Ensure that lab coat is replaced if it comes into contact with hazardous chemicals.
5.2.3. Wear shoes that adequately cover the whole foot to protect feet from spillages.
5.2.4. Ensure that safety specs are worn when handling substances that may harm your eyes. Normal prescription eye glasses do not provide appropriate laboratory eye protection.
5.2.5. Ensure that an appropriate mask is used whenever fumes or dust may be inhaled.
5.2.6. Ensure that disposable gloves are used when handling chemicals.
5.2.7. Ensure that appropriate acid/base resistant long gloves are used when handling strong acids or bases.

5.3. Chemicals

5.3.1. Perform regular annual inventory inspections of chemicals and update accordingly.
5.3.2. Read the label of chemical containers carefully and be familiar with the storage, handling and disposal procedures of the chemicals.
5.3.3. Be familiar with the safety symbols present on the containers of the chemicals present. A list of common safety symbols encountered is present in the ‘Common Safety Symbols’ Table (SOP/PD/103_02/A1).
5.3.4. Compile all the Material Safety Data Sheets (MSDSs) of the chemicals present, store in a designated file and place it in a central easily accessible location in the laboratory for all staff and students in the lab.
5.3.5. Ensure that when weighing out a chemical, weight out only the amount that is needed and do not return the excess to its original container, but dispose of it in the appropriate waste container.

5.3.6. Avoid exposure of chemicals to heat and direct sunlight.

5.3.7. Ensure that when mixing concentrated acids with water, never add water to the acid but always add the acid slowly to the water.

5.3.8. Keep chemical containers closed unless actively in use.

5.3.9. Store strong oxidisers in a glass container, in a metal tray away from reducing, organic, dehydrating and flammable agents.

5.3.10. Ensure that a chemical hood is used whenever there is the possibility of the release of toxic chemical vapours, dust or gases.

5.3.11. Keep head and body outside of the hood face and place the chemicals and equipment at least 15cm within the hood to ensure proper air flow.

5.3.12. Ensure that when a chemical spill occurs, neutralise acids with powdered sodium hydrogen carbonate (baking soda) and bases with 5% acetic acid solution (vinegar). Avoid inhaling any vapours which can be produced and spread appropriate sand to absorb the neutralised chemical. Sweep up and dispose of as hazardous waste.

5.3.13. Ensure that when a chemical spill comes into direct contact with human skin, flush the area with copious amounts of cold water for at least 5 minutes and seek medical attention if damage to skin is evident.

5.3.14. Ensure that stained clothes are removed immediately.

5.4. First Aid

5.4.1. Ensure that the following items are present in each first aid box:

5.4.1.1. Cotton wool
5.4.1.2. Cotton pads
5.4.1.3. Surgical gauze
5.4.1.4. Crepe bandage
5.4.1.5. Surgical spirit
5.4.1.6. Surgical tape
5.4.1.7. Plasters
5.4.1.8. Eye wash
5.4.1.9. Burn spray

5.4.2. Ensure that missing items are replaced as soon as they are used.
5.4.3. Check all available first aid boxes every two months to replace any missing items or items that have expired.

5.5. Storage

5.5.1. Organise chemicals by compatibility, then store alphabetically within the same compatible groups.
5.5.2. Ensure that chemicals are not stored above eye level.
5.5.3. Ensure that chemicals are not stored on the floor.
5.5.4. Ensure that corrosives are not stored on high shelves.
5.5.5. Ensure that chemical storage areas are adequately ventilated.
5.5.6. Ensure that flammable liquids are stored in a flame resistant cabinet.
5.5.7. Ensure that chemical hood is not used as a storage area for chemicals and solvents.
5.5.8. Ensure that all materials present in the laboratory refrigerator are labelled with:

5.5.8.1. Name and course year (if applicable)
5.5.8.2. Storage date
5.5.8.3. Disposal date
5.5.8.4. Storage conditions

5.5.9. Ensure that no food or beverages are stored in a refrigerator used for laboratory work.

5.6. Waste Management and Disposal

5.6.1. Ensure that classroom demonstrations are performed for experiments that generate large amounts of chemical waste.
5.6.2. Distinguish between general and hazardous waste.
5.6.3. Place general waste in designated plastics bags.
5.6.4. Label hazardous waste and give to the laboratory officer present for safe disposal.
5.6.5. Flush small quantities of aqueous solutions down the drain.
5.6.6. Store large volumes of non-aqueous solutions in labelled glass bottles and give to laboratory officer for safe disposal.
5.6.7. Ensure that broken glassware and sharp objects are properly disposed of in designated containers.

5.6.8. Ensure that biological waste (such as blood and urine) is disposed of as bio-hazardous waste.

5.7. Emergency

5.7.1. Ensure that emergency phone number (Fire and Ambulance 112) is posted on the laboratory doors.

5.7.2. Be familiar with the location and use of the first aid box and its contents.

5.7.3. Ensure that Foam, Powder and Carbon dioxide type fire extinguishers are present at the exit of each laboratory.

5.7.4. Ensure that access to fire extinguishers is unobstructed.

5.7.5. Limit the use of fire extinguishers to trained personnel and only use if fire is small, contained and has yet not spread beyond its starting point.

5.7.6. Recharge fire extinguisher immediately after use regardless of how much it was used.

5.7.7. Do not attempt to fight the fire if this is not small. Leave the laboratory, close door and phone 112 immediately.

5.7.8. Leave the laboratory if fumes are being released.

5.7.9. Call 112 in case of life threatening injuries such as severe burns, loss of consciousness and uncontrolled bleeding.
5.8. Flow Chart

5.8.1. General Safety

Start

Only authorised personnel allowed in laboratory

Yes

Allow access only to authorised personnel

No

Entrance into laboratory recorded into entry logbook

Yes

Record entry

No

More than 10 students present in a session

Yes

Allow only 10 or less students per session

No

Do not run or throw items in laboratory

Unsafe conditions / actions

Yes

Call attention to them so that corrective action is taken

Defective equipment being used

Yes

Stop using immediately

Do not sit on laboratory benches

No

Do not eat, drink, smoke, chew gum, apply cosmetics or manipulate contact lenses

Long hair

Yes

Tie backwards

No

Scarfes and coats

1

2
1. Remove and place in designated area for personal belongings

2.
- Dangling jewellery
  - Yes: Remove and place in designated area for personal belongings
  - No: Work areas clean and uncluttered
  - Yes: Clean and organise work areas
  - No: Floor kept clear of all objects
  - Yes: Keep waste in appropriate containers and label for proper disposal
  - No: Lit bunsen burner/s left unattended
  - Yes: Do not leave unattended or else switch off
  - No: Wash hands well with soap and water after handling chemicals

End
5.8.2 Lab Wear

Start

Wear cotton lab coat and keep buttoned at all times

Lab coat came into contact with hazardous chemical/s

Yes

Replace lab coat

No

Wear shoes that adequately cover whole foot

Safety specs worn when handling substances that may harm eyes

No

Wear safety specs even if you have prescription glasses

Yes

Appropriate mask used whenever fumes or dust may be inhaled

No

Use accordingly

Yes

Disposable gloves used when handling chemicals

No

Use accordingly

Yes

Acid/base resistant long gloves used when handling strong acids or bases

No

Use accordingly

Yes

End
5.8.3 Chemicals

Start

Perform regular annual inventory inspections of chemicals and update accordingly

Read label of chemical containers and be familiar with their storage, handling and disposal procedures

Be familiar with safety symbols present on containers of chemicals (see Appendix 1)

Compile all MSDSs of chemicals present and store in designated file that is easily accessed

Weighing out a chemical

No

Avoid exposure of chemicals to heat and direct sunlight

Mixing concentrated acids with water

Yes

Add the acid slowly to the water and not the other way round

No

Keep chemical containers closed unless actively in use

Store strong oxidisers in glass container, in a metal tray away from reducing, organic, dehydrating and flammable agents

Need to use chemical hood

Yes

Keep head and body outside of hood face and place chemical and equipment at least 15cm within hood to ensure proper air flow

No
Chemical spill

Neutralise acids with powdered sodium hydrogen carbonate (baking soda) and bases with 5% acetic acid solution (vinegar)

Spread appropriate sand and avoid inhaling any fumes that might be produced

Sweep up and dispose of as hazardous waste

Chemical spill in direct contact with human skin

Flush area with copious amounts of cold water for at least 5 minutes

Damage to skin is evident

Seek medical attention

Clothes stained

Remove immediately

End
5.8.4 First Aid

- Start
  - Items listed in section 5.4.2 present in each first aid box
    - Yes
    - Missing items replaced as soon as they are used
      - Yes
        - Check all first aid boxes every two months
      - No
        - Replace as soon as they are used
    - No
      - Include missing items

- End
5.8.5 Storage

Start

Organise chemicals by compatibility, then store alphabetically within the same compatible groups

Chemicals stored above eye level

Yes

No

Chemicals stored on the floor

Yes

No

Chemicals stored above eye level

Yes

Alter storage arrangement to alleviate this

Chemicals stored on the floor

Yes

Alter storage arrangement to alleviate this

Chemical storage areas adequately ventilated

Yes

No

Provide ventilation

Flammable liquids stored in flame resistant cabinet

Yes

No

Store accordingly

Chemical hood used as storage area for chemicals and solvents

Yes

No

Remove from chemical hood

Materials present in refrigerator labelled as specified in section 5.5.8

Yes

No

Label accordingly

Food or beverages stored in refrigerator used for laboratory work

Yes

No

End

Remove from refrigerator

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5.8.6. Waste Management and Disposal

Start

Classroom demonstrations performed for experiments that generate large amounts of chemical waste

Yes

No

Perform classroom demonstration in these cases

Distinguish between general and hazardous waste

General waste produced

Yes

No

Place in designated plastic bags

Hazardous waste produced

Yes

No

Label and give to laboratory officer

Handling aqueous solutions

Yes

No

Flush in small quantities down the drain

Handling non-aqueous solutions

Yes

No

Store in labelled glass bottles and give to laboratory officer

Handling broken glassware/sharp objects

Yes

No

Dispose of in designated containers

Biological waste disposed of as bio-hazardous waste

Dispose of accordingly

End

Yes

No

No

No

Yes

No

No

Yes
5.8.7. Emergency

Start

- Emergency phone number sticker posted on laboratory doors
  - Yes
    - Be familiar with location and use of first aid box and its contents
  - No
    - Post accordingly

- Access to fire extinguishers unobstructed
  - Yes
    - Fire present
      - Yes
        - Fire small, contained and has yet not spread beyond its starting point
          - Yes
            - Know how to operate fire extinguisher
              - Yes
                - Delegate task to trained individual
              - No
                - Leave laboratory, close door and phone 112 immediately
            - No
              - Delegate task to trained individual
        - No
          - Leave laboratory, close door and phone 112 immediately
    - No
      - Provide access

- Foam, Powder and CO\textsubscript{2} fire extinguishers present at exit of each laboratory
  - Yes
    - Buy necessary fire extinguisher/s
  - No
    - Provide access
Use fire extinguisher

Recharge fire extinguisher immediately after use regardless of how much it was used

Fumes present

Yes

Leave laboratory

No

Life threatening emergencies

Yes

Call 112 immediately

No

End
6. Precautions

Same as Section 5; Procedure

7. References


8. Appendices

*SOP/PD/103_02/A1* – Common Safety Symbols Table
9. Revision History

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<thead>
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<th>Version Number</th>
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<td>01</td>
<td>Initial Release</td>
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<tr>
<td>02</td>
<td>Change in Scope and Objective</td>
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<tr>
<td></td>
<td>Addition of 16 new definitions</td>
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<td>Additional information added to all 7 sections of the procedure</td>
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<td>Removal of Sharps section</td>
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<td>Additional information about the use of fire extinguishers</td>
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<td>Inclusion of flow charts</td>
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<td>More sourced references</td>
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<td>Appendix 1 with Common Safety symbols</td>
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SOP/PD/103_02/A1 – Common Safety Symbols Table*

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<thead>
<tr>
<th>Symbol</th>
<th>Meaning of Symbol</th>
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<tr>
<td><img src="Symbol.png" alt="Compressed Gas" /></td>
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<tr>
<td><img src="Symbol.png" alt="Corrosive" /></td>
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<tr>
<td><img src="Symbol.png" alt="Environmental Hazard" /></td>
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<tr>
<td><img src="Symbol.png" alt="Explosive" /></td>
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</tr>
<tr>
<td><img src="Symbol.png" alt="Flammable" /></td>
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</table>
Adapted from the Globally Harmonised System of Classification and Labelling of Chemicals, United Nations New York and Geneva, 2005 (see references).